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NEW METHODS OF TEXTILE TECHNOLOGY

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NEW METHODS OF TEXTILE TECHNOLOGY

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1. In Czechoslovakia, the shuttleless looms are now developped as jet looms, i.e. looms carrying the weft taken off from the large shape cheese and inserting it into the shed by means of a water jet (in the case of looms used for the manufacture of synthetic fabrics) or of an air streem (in the case of the remaining fabrics).

2. The pick based on this principle exhibite, besides the current advantages of the shuttleless systems further considerable advantages over the remaining shuttleless systems in particular:

3. The weft can be accelerated inside the shed and this feature makes it possible to attain high mean picking velocities even in the case of small loom widths (the long starting and braking paths on the sides of the shed are not required).

4. There is no risk of weaving- in the weft carrier and there is no need to insert, between the picking cycle and the cycle of beating up the weft, another cycle for the check up of the arrival of the weft carrier, the latter entailing time-losses in the case of the other picking methods.

5. The reversion of the weft carriers is eliminated and the design of the loom may be simple indeed (the existing jet looms having smaller numbers of parts than the automatic shuttle looms).

6. The noise due to the operation is out down to the lowest degree of all the available weaving methods.

a) Hydraulic jet looms:

These looms are designed for manufacturing of plain weaves, four- and eight-end fabrics. They are particularly suitable for the manufacture of light and medium-heavy fabrics made from synthetic yarns.

i) Principal technical characteristics: Effective reed space-105 cm; working revolutions (350,400 rev.min.; input of electric motor- 0,8 kW; weigh of machine-1100 kg; overall width of machine-1,800 mm; depth of machine - 1,300 mm; maximum height of mach'ne 1.400 mm; number of ends: 8-120 picks/cm.

ii) The results obtained in plants equipped with current automatic shuttle looms and the results achieved in plants equipped with the type H 105 B hydraulic jet looms are the following:

Index	Weaving mill equipped with automatic shuttle looms	H 105 B looms
Manpower required for the production of 100 metres/year	0,097 workers	0,067 workers
index	100	69
Ground-plan area of plant required for the production of 1000 metres/year total	2,19 sq.metres	1,0 sq.metres
index	100	46
Capital expenditure of building a yearly production capacity of 1000 metres (4000 hours per year)	8140 Cz.crowns	5810 Cz.crowns
index	100	71,3
Breakdown:		
Machinery	6390 Cz.crowns	4830 Cz.crowns
Buildings	1750 Cz.crowns	980 Cz.crowns
Total costs of production of 1000 metres of fabrics	5481 Cz.crowns	4522 Cz.crowns
index	100	82,6
Breakdown:	Cz.crowns	
Wages	1465,90	886,10
Auxillary materials	68,50	43,10
Heating and power	158,20	84,90
Maintenance	238,70	158,50
Depreciation	611,70	431,10

The above results have been obtained with the average number of 44 filling threads per 1 centimetre and while processing rather inferior materials, with an average of 350 rev./min. of the loom and the average efficiency of the loom of 80,67 p.c. Further tests have demonstrated that when processiong high-grade synthetic materials there is no difficulty in attaining an efficiency of 92 p.c. at 400 rev/min.

iii) The jet looms are destined for the manufacture of a wide assortment and that from the finest fabrics in minifil with number of ends in warp 142 and 120 pics /cm up to filter cloths about 245 g per m^2 from 200 den. Fibres used in warp and 2 x 200 den fibres for weft. The jet looms are especially destined for manufactoring of fabrics for outerwear, lingerie, shirts, coats, tent linen and weaves for technical purposes.

b) Pneumatic jet looms:

These looms are designated as type P 105 and destined for the manufacture of light and medium-heavy kinds of fabrics, especially of staple yarns from cotton, viscose, synthetic and mixtures as well as silk fabrics. They may be equipped for the weaving of plain weaves, on four-end wills, crepes and hopsacks Special accessories make it possible to weave even five-end fabrics.

i) Principal technical characteristics: Effective reed space - 105 cm; working revolutions - 350-400 rev/min; efficiency of machine depending on the processed material, on an average - 80 p.c. at 400 rev/min; input of 1,5 kW incl.pressure air-1kW; weight of machine - 847 kg; overall width of machine - 1750 mm; depth of machine - for 700 mm diameter of warp-beam-1410 mm; maximum height of machine - 1350 mm; number of ends: ß 5 - 120 picks/cm.

ii) For the sake of a comparison of the technical and economic parameters of jet looms with those of up-to date automatic shuttle looms as well as mechanical shuttle looms a comparison of three weaving mills has been worked out, each of the mills being equipped with four hundred looms of the indicated alternative types, and with low-speed machines in the preparatory shop for weaving, such machines requiring only a minimum maintenance and attendance.

The comparison is based on the production of grey cotton cloth (molino) for printing, reed space 83 cm, width of cloth 78 cm, numberof ends in warp and weft 21 threads per cm, material cotton yarn number metric 34, in warp and weft. A two-shift operation, yielding 4280 operating hours per year has been reckoned with.

The comparison yielded the following technical and economic index values:

Index	Unit	Weaving mill equipped with 400 looms		
		Mechanical looms	Automatic shuttle looms	P 105 jet looms
Revolutions of loom	rev/min	178	220	400
Efficiency of loom	p.c.	70	85	80
Production per 1 100cm/hr in metres	m	3,4	5,34	9,14
Yearly production of plant in metres	m	5,820.800	9,142.080	15,647.680
Index		63,67	100,-	171,16
Total number employed	persons	306	260	339
Yearly production per 1 employed person	m	19.022	35.162	46.158

Index	Unit	Weaving mill equipped with 400 looms		
		Mechanical looms	Automatic shuttle looms	P 105 jet looms
Index		55	100	131,3
Total floor space of plant (incl. auxiliary and similar floor space	sq.m.	5.441	7.552	7.933
Floor space required for annual production of 1 million metres	sq.m.	934	826	507
Index		113	100	61

The above values bear a clear testimony to the high level of the technical and economic indices of the jet looms. In addition no higher qualification or skill is expected of the weavers than in the case of standard automatic looms. The above values are obtained also in case simple machinery is retained in the preparatory workshop. A comparison covering weaving mills with preparatory workshops equipped with the most up-to-date automatic machinery would yield still more convincing results in favour of the jet looms.

II. Nonwoven fabrics:

7. Of particular interest is the new Czechoslovak textile technology of manufacturing fabrics by knitting-through a fleece from staple fibres. For fabrics produced by this method the name ARACHNE has recently become current. The manufacture of this kind of goods is based on knitting-through a fleece made from textile staple fibres. The method takes the place of weaving or knitting, elimitating at the same time, predominantly or entirely, the need for spinning textile staple raw materials. In this respect it should be noted that the production of ARACHNE fabrics is based, on an average to the extent of 80 p.c., on a fleece made from unspun textile materials, reinforced by knit-bond yarn. The latter is formed, according to the requirements of the particular product from various kinds of yarns or silk on the knitting-through machine ARACHNE, which has been invented and developed in Czechoslovakia, and also tested in the textile industry of this country.

a) Parameters of the ARACHNE knitting-through machine: Speed (r.p.m.) of machine - 270-500 r.p.m.; machine gauge-18,21 and 24 Sax.double; working width - 1.800 mm; number of guide bars - 1 or 2; guide cams (alternatives) - chain stitch, tricot, plain cord, diamind, weft; number of needles (latch and guide needles) per machine: 18 Sax double - 690; 21 Sax.double - 805; 24 Sax.double -

920; stitch density - from 20 to 100 per 10 cm; weight range of produced knitted-through fabrics - from 100 to 700 g/sq.m; machine efficiency - 65-85 p.c.; production per 8 hours - 150 - 450 metres.

Another developmental type of the knitting-through ARACHNE machine has reached an advanced stage of development and testing. It has been designed as a high-speed machine with 1000 rev/min, i.e. with a double maximum performance.

i) Functional parts of the knitting-through ARACHNE machine: Machine frame, mechine drive, needle motion, guide bars, warp let-off motion, web feed, outting motion, starting motion, fabric rolling device.

The working mechanism of the machine is formed by such parts as take an active part in producing the basic element of the knitted through fabric, such basic element being a course.

These parts are: The needles (incl.latches), the guide needles, the looking sinkers, and the knock over sinkers with driving mechanism.

ii)The formation of the basic element of the ARACHNE fabric, the course, may be divided into the following phases: Puncturing the fleece, lapping the thread, looking-in of the needles, loop sinking and knocking over, taking up. The forming of loops is analogous to the knitting on a warp knitting machine.

b) The preparation of the fleece for knitting-through on the ARACHNE machine in large scale production is done either on wool roller cards, or on cotton flat cards, or on special pneumatic webbers. The webs fed from the cards with fibres oriented predominantly in the longitudinal direction are folded, on the adapted Blamier lap apparatus into a fleece, the being now predominantly deposited in the transversal direction. The laps of these fleeces reinforced by pressing and having the required lengths are fed to the horizontal conveyer of the knitting-through machine. When producing heavy or combined ARACHNE fabrics it is possible to introduce two or three laps of fleece at a time. If required, also other covering or reinforcing fabrics or foils may be presented for knitting-through together with fleeces.

c) From the knitted-through ARACHNE fabrics of which on ARACHNE test plants alone 8 to 9 million square yards a year are produced in Czechoslovakia, diverse types of apparel are made for children, for young people, for men and women. Fabrics are produced for covering furniture and for decoration. Diverse ARACHNE fabrics are used in the shoemaking industrym in the manufacture of leather articles

and of artificial leathers. ARACHNE fabrics have also proved most effective as filtering fabrics. The research continues to develop and test further new types of ARACHNE fabrics for various purposes. The knitting-through techniques as well the techniques of the preparation of fibre fleeces are being modified and improved. The technology of the production of knitted-through fabrics is being extended and perfected, new types of products are formed by introducing new raw materials and their processing.

d) From the economic angle the described new method of production of fabrics is of interest, for it shortens, in a revolutionary manner, the hitherto known technological processes.

The output of the ARACHNE knitting.through machine is 6 to 10 times that of the automatic loom. In addition the spinning of fibres is eliminated. Compared to the classical production methods the Czechoslovak ARACHNE plants have already achieved an increase in the production per operator of up to 300 p.c. As soon as the perfected high-speed ARACHNE has been introduced of 400 to 500 p.c. of the labour productivity will have become realizable. It has been proved that the costs of the production of the ARACHNE method are reduced, in the item of direct wages, to 1/2 to1/3. The other cost items of the nature of overheads are also reduced substantially since the required floorspace, machinery and power as well as the amount of depreciation in the ARACHNE method are no more than 35 to 40 p.c. of the corresponding cost items of the production requiring the spinning and subsequent weaving or knitting of the raw material.

These advantageous operating features exert a favourable influence on the need for investment funds whereever new production capacities are to be built. While e.g. the building of a cotton-spinning, weaving and finishing mill for the yearly production of some 30 million square metres of average finished cotton fabrics requires an investment of 11.80 Cz.crowns per sq.metre of finished fabric, the building of a comparable ARACHNE capacity, equipped with a finishing shop which is equally expensive to built, requires an investment at the rate of mere 3.90 Cz.crowns per each projected sq.metre of the comparable ARACHNE production.

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